Small Business Innovation Research/Small Business Tech Transfer

Advanced Long-Range Video Capabilities Using Speckle Imaging Techniques, Phase I

Completed Technology Project (2012 - 2012)

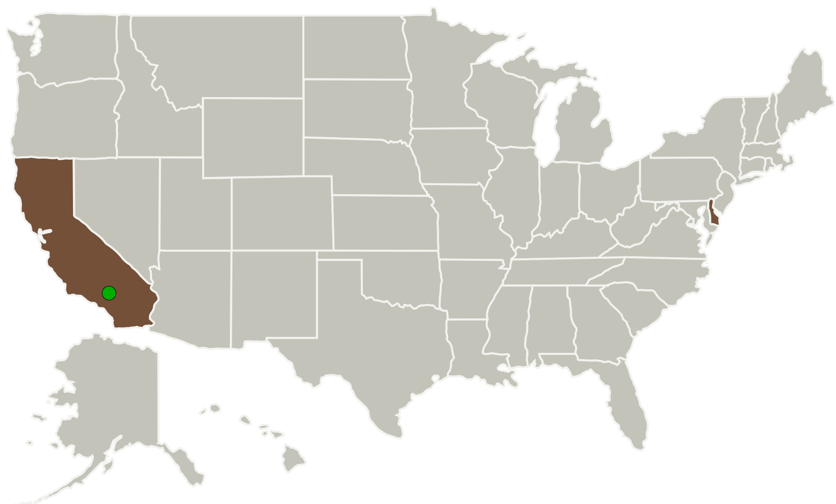
Project Introduction

Flight-testing is a crucial component in NASA's mission to research and develop of new aeronautical concepts, allowing for verification of simulated and wind-tunnel results, and exposing previously unforeseen design problems. Video is an invaluable tool for flight-testing, allowing the collection of a wealth of information; however, collected long-range imagery typically suffers from scintillation, blurring, poor spatial resolution and low contrast. For decades, astronomers have developed effective image processing solutions to the problem of imaging through long stretches of atmosphere. One such image processing technique, Bispectrum Averaging Speckle Imaging, has been proven to compensate for heavy atmospheric effects at both visible and IR wavelengths. The computational requirements, however, made field deployment of a real time solution difficult. In 2007, we accelerated the Speckle algorithm for NASA using a Field Programmable Gate Array. This work demonstrated that the real-time implementation of a complex algorithm such as this one is possible with a hardware platform. Although this implementation could improve imagery under many scenarios, large power requirements due to hardware use limited the scenarios in which the platform could be deployed. Lastly, this work does not contain many of the enhancements that we, in partnership with Lawrence Livermore National Labs have made to the software algorithm since that date. We propose to evolve the previous hardware design by taking advantage of the improvements to manufacturing that have come to industry over the past 3 years. By coupling newer, less-expensive hardware with enhancements and simplifications to the Speckle algorithm, we will also be able to offer a solution that is significantly lower cost and lower power. A new design will vastly increase the capability and feasibility of deployed atmospheric correcting technologies, which will in turn benefit NASA by making flight-testing more safe.

Advanced Long-Range Video Capabilities Using Speckle Imaging Techniques, Phase I

Table of Contents

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
EM Photonics, Inc.	Lead Organization	Industry	Newark, Delaware
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Delaware

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140260)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

EM Photonics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

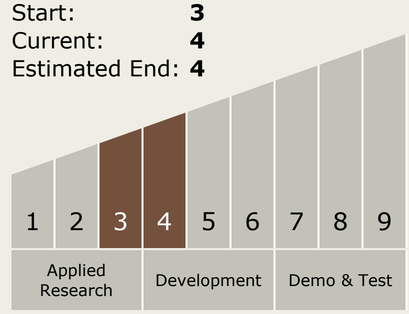
Carlos Torrez

Principal Investigator:

Fernando Ortiz

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  └ TX13.2 Test and Qualification
    └ TX13.2.4 Verification and Validation of Ground, Test, and Surface Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System